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1300-N EMERGENCY DUMP BASIN: AN ANALYSIS OF RADIONUCLIDE CONCENTRATIONS AND THE POTENTIAL FOR BIOTRANSPORT

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1300-N EMERGENCY DUMP BASIN: AN ANALYSIS OF RADIONUCLIDE CONCENTRATIONS AND THE POTENTIAL FOR BIOTRANSPORT

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1300-N EMERGENCY DUMP BASIN: AN ANALYSIS OF RADIONUCLIDE CONCENTRATIONS AND THE POTENTIAL FOR BIOTRANSPORT

1.0 INTRODUCTION

The 1300-N Emergency Dump Basin (EDB) is a liquid effluent storage basin that was originally designed to receive emergency cooling water from the N Reactor. This facility was found to be inadequate and was replaced by the 1304-N Emergency Dump Tank (EDT) Facility. At the present time the 1300-N EDB is used as a holding basin for contaminated liquid effluent periodically generated during blowdown operations of N Reactor's twelve steam generators.

The EDB is an open air basin surrounded by a four foot wire mesh fence with signs marking it as a radiation zone. Several species of insects utilize this water as a breeding area during the spring and summer. Cliff swallows that nest on the northwest side of the nearby 109-N Building have been observed to use the EDB as a source of water and food. Because the EDB is an open air facility, it is possible that contamination within the basin may be passed to the immediate environment through food chains. Earlier surveys of swallow nests and excrement from the 109-N Building area have shown some radioactive contamination (Diediker 1979). Attempts have been made to discourage nesting by the swallows that inhabit this area during the spring and summer months.

The purpose of this report is to evaluate the contamination levels in the EDB and the possibility of transport of contaminants to and within the local biotic communities (biotransport). This report will also evaluate possible remedial and long-term actions necessary to reduce the potential for biotransport of radionuclides.

2.0 SUMMARY

The EDB effluent contains low levels of several activation and fission products common to primary coolant discharge. At the present time concentration levels of these radionuclides are low. Current operating modes and the condition of the steam generator piping indicate that this trend should continue. Evaluation of samples from the EDB indicates the presence of contaminated sludge on the bottom of the tank. This sludge layer presents the major and most persistent source of contamination in the EDB Facility.

Biotransport of the radionuclides contained within the EDB Facility is a potential problem since it is an open air basin. The major pathway of environmental radionuclide release from the basin is by way of the colony of cliff swallows that nest on nearby buildings. These migratory birds use the basin as a source of water and feed on the resident insect population. Nest building activities by these birds may concentrate contamination in nest materials. This biotic pathway does not contain man and appears to result in minimal transmission of assimilated radionuclides.

A recent incident concerning low water levels in the EDB demonstrates a pathway for direct assimilation of radionuclides by man. Operational error allowed the bottom sludge layer in the EDB to become exposed. Subsequent drying and suspension of the particulates in air could have lead to inhalation of EDB contaminates by nearby workers. This is probably the most important release pathway to the immediate environment.

Several alternative actions are presented in order to insure controlled operation of the EDB. These include the use of water level indicators, instrumentation, and leveling switches tied into the existing submerged discharge pump to insure adequate water levels. It may also be desirable to remove the contaminated layer of sludge from the bottom of the basin. In addition, continued eradication of swallow nests from the nearby buildings may be necessary to insure protection against the possibility of radionuclide biotransport. Another option is to construct a cover over the EDB to insure radiological control of the area. Finally, it may be appropriate to consider removing the EDB completely and routing steam generator blowdown directly to the 1301-N/1325-N Liquid Waste Disposal Facilities (LWDF).

3.0 1300-N EMERGENCY DUMP BASIN FACILITY

3.1 Operation of the 1300-N EDB

The 1300-N Emergency Dump Basin is located northwest of the 109-N Building (Figure 3.1). The facility is a concrete basin with a welded steel liner, originally designed to receive "single pass" emergency cooling water. In the late 1960's the EDB was determined to be insufficient for the original use. The basin does not have the capacity to hold the volume of coolant that would now be used during an emergency cooling operation. There was concern that during an emergency cooling operation the basin might be filled to overflowing. At that time it was also deemed undesirable to have an open basin near the main reactor facility that may contain high levels of radionuclides.

The EDB is now used to hold contaminated liquid effluent generated during the periodic blowdown of N Reactor's twelve steam generators. Condensed secondary coolant is periodically released from the steam generators in order to control the chemical composition of the secondary coolant. As old coolant is discharged from the steam generators, fresh coolant is introduced into the system thus diluting the chemical species of concern (dissolved oxygen, hydrazine, chloride compounds, and the pH). Approximately 82,150 gallons of blowdown are generated each month when N Reactor is in normal operation (Dorian 1979). This condensate normally contains very low levels of radioactive contamination and is discharged to the Columbia River via the 102 inch discharge line.

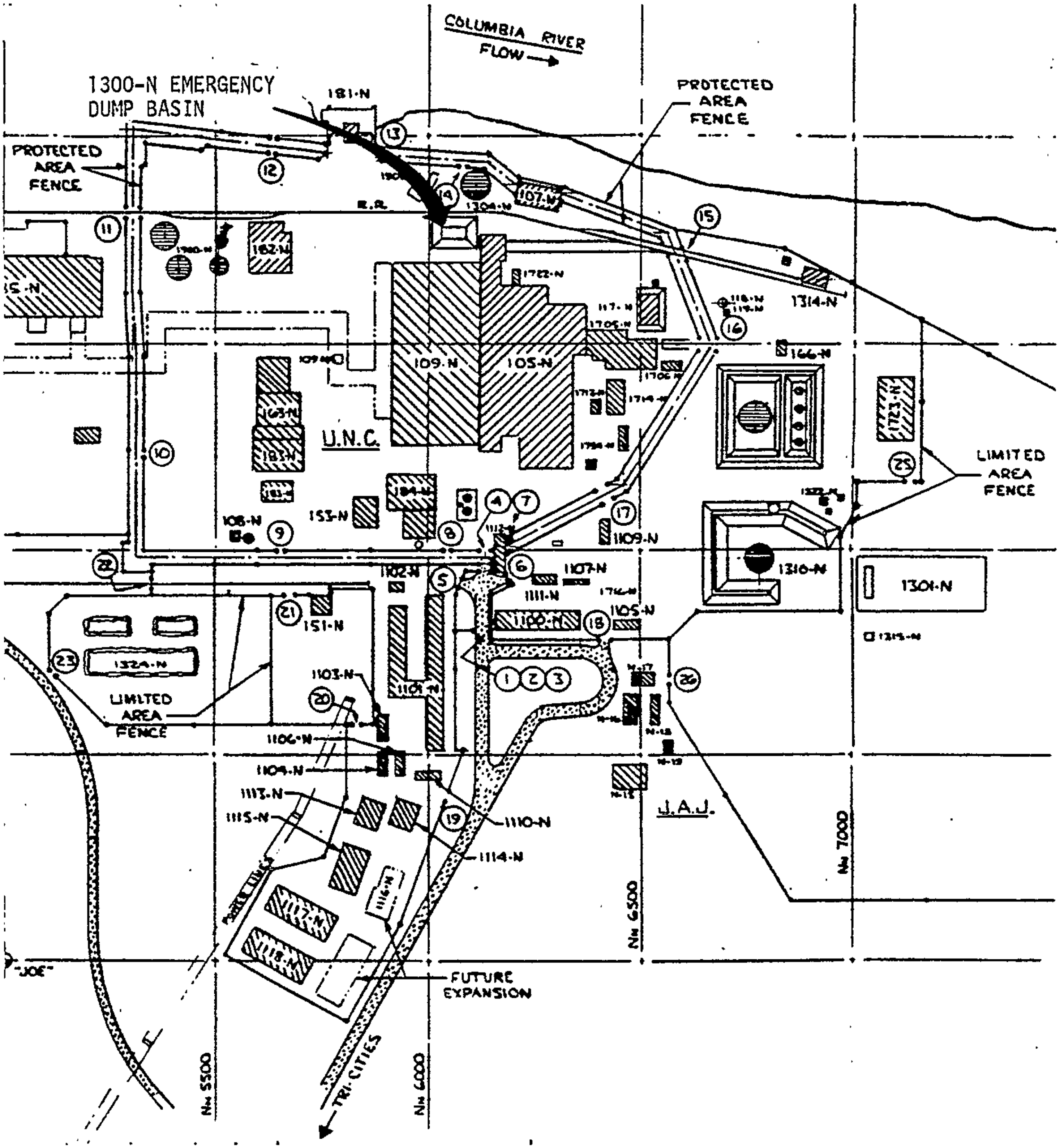

Figure 3.1 Location of the 1300-N Emergency Dump Basin Facility

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Some leakage of primary coolant into secondary coolant occurs in the steam generators. This results in slight concentrations of radionuclides in the steam generator blowdown. The blowdown effluent is therefore monitored for radionuclide concentration. In the event of unacceptable levels of contamination, the effluent from the leaking generator is diverted to the Emergency Dump Basin. If possible, the leaking generator is then taken out of service until repairs have been conducted. Until recently steam generator #5 had not been used for several years because of such internal tube leakage. From 1981 to 1984 the internal tubing of generator #5 was completely replaced. No other steam generators have recently had any major leakage problems. All leaking generator tubes have been periodically repaired and/or replaced.

Another method of controlling potential contamination of blowdown effluent is by monitoring the discharge volume. When the steam generator leakage rate exceeds 50 gallons per hour the effluent is routed to the EDB regardless of contamination levels. Maximum rate of blowdown could be as high as 70 gallons per minute. Recently the rupture disc mechanism responsible for routing this discharge has malfunctioned, resulting in a discharge of relatively uncontaminated blowdown to the EDB.

Water levels in the EDB are maintained within a high/low annunciation range. When high water levels are observed, excess effluent is pumped to the 1301-N/1325-N LWDFs by way of a 32 inch flush line. A submersible pump is used to withdraw the effluent from the bottom of the 1300-N EDB.

3.2 Contamination Levels in the 1300-N EDB

Water samples from the 1300-N EDB are analyzed on a monthly basis. The samples are drawn from near the bottom of the basin. Samples are analyzed for gamma emitting radioisotopes with the results expressed as concentration levels (pCi/l). The samples are not filtered prior to analysis.

Table 3.2.1 shows the average annual concentrations by nuclide in the 1300-N EDB from 1978 to the present. Only nuclides with relatively long half-lives are consistently found in the samples. This effect is probably the result of two major factors; the time period between sampling (one month), and the sporadic nature of blowdown discharge to the 1300-N EDB. Some of the infrequently detected isotopes may be the result of steam generator tube leaks. Failure of a heat exchanger tube typically results in increased levels of several radionuclides in the secondary coolant. The timing of the sample analysis is critical in detecting many of the short-lived nuclides. In contrast, the relatively long-lived corrosion and fission products prevalent in primary coolant (Mn-54, Co-60, and Cs-137) appear consistently in all samples.

TABLE 3.2.1

Average Annual Concentrations of Radionuclides (pCi/l)
Detected in Water Samples from the 1300-N EDB

Radionuclide	1978	1979	1980	1981	1982	1983	1984	1985*
K-40	4.2E1	---	---	---	---	---	---	---
Mn-54	5.1E1	1.5E4	4.1E3	1.0E3	2.7E3	7.1E3	4.1E2	---
Fe-59	---	7.4E3	1.0E3	---	---	---	---	---
Co-58	---	1.1E3	4.8E2	---	---	---	---	---
Co-60	1.1E3	4.8E4	2.0E4	1.3E4	7.5E4	3.4E5	3.6E4	3.1E2
ZrNb-95	---	1.6E3	2.4E3	---	---	---	9.9E1	---
Ru-103	---	2.0E2	6.6E2	---	---	3.5E2	---	---
Sb-124	---	3.4E2	---	---	---	---	---	---
I-131	2.1E2	3.8E3	3.7E2	5.5E2	---	---	2.9E2	---
Cs-137	1.6E2	2.0E2	2.4E2	4.2E2	1.3E3	8.8E3	1.0E3	9.0E1
BaLa-140	5.9E2	4.7E3	1.3E3	5.6E2	---	---	3.3E2	---
Total	2.2E3	8.2E4	3.1E4	1.6E4	7.9E4	3.5E5	3.8E4	4.0E2

* Year-to-date

--- Not detected above background levels

Figure 3.2 shows total annual concentrations in the EDB from 1978 to the present. The figure also includes concentration levels for each of the principal corrosion products. These data show that Co-60 is the major radionuclide affecting concentration levels in the EDB Facility. Concentration levels of Mn-54 appear to be of relative importance and follow the same annual trend as Co-60 concentrations. In contrast, concentrations of Cs-137 show increasing levels until 1984.

The major fluctuations in the concentration levels reflect the operational practices relating to the EDB. From 1981 to 1983 concentration levels increased. Steam generator tube leakage has been documented during this time. Evaporation of water from the EDB may also result in concentrating the longer lived radionuclides. The two corrosion products Fe-59 and Co-60 form relatively insoluble oxides in water and would tend to settle to the bottom of the tank where the samples are withdrawn.

During 1984, mechanical failure of the rupture disc system resulted in a greater than normal flow of relatively "clean" water to the EDB. The corresponding increased rate of withdrawal of effluent from the EDB may have removed much of the accumulated sludge and diluted the remaining radionuclides. Concentration levels would then decrease as shown by the data. This trend has continued during 1985.

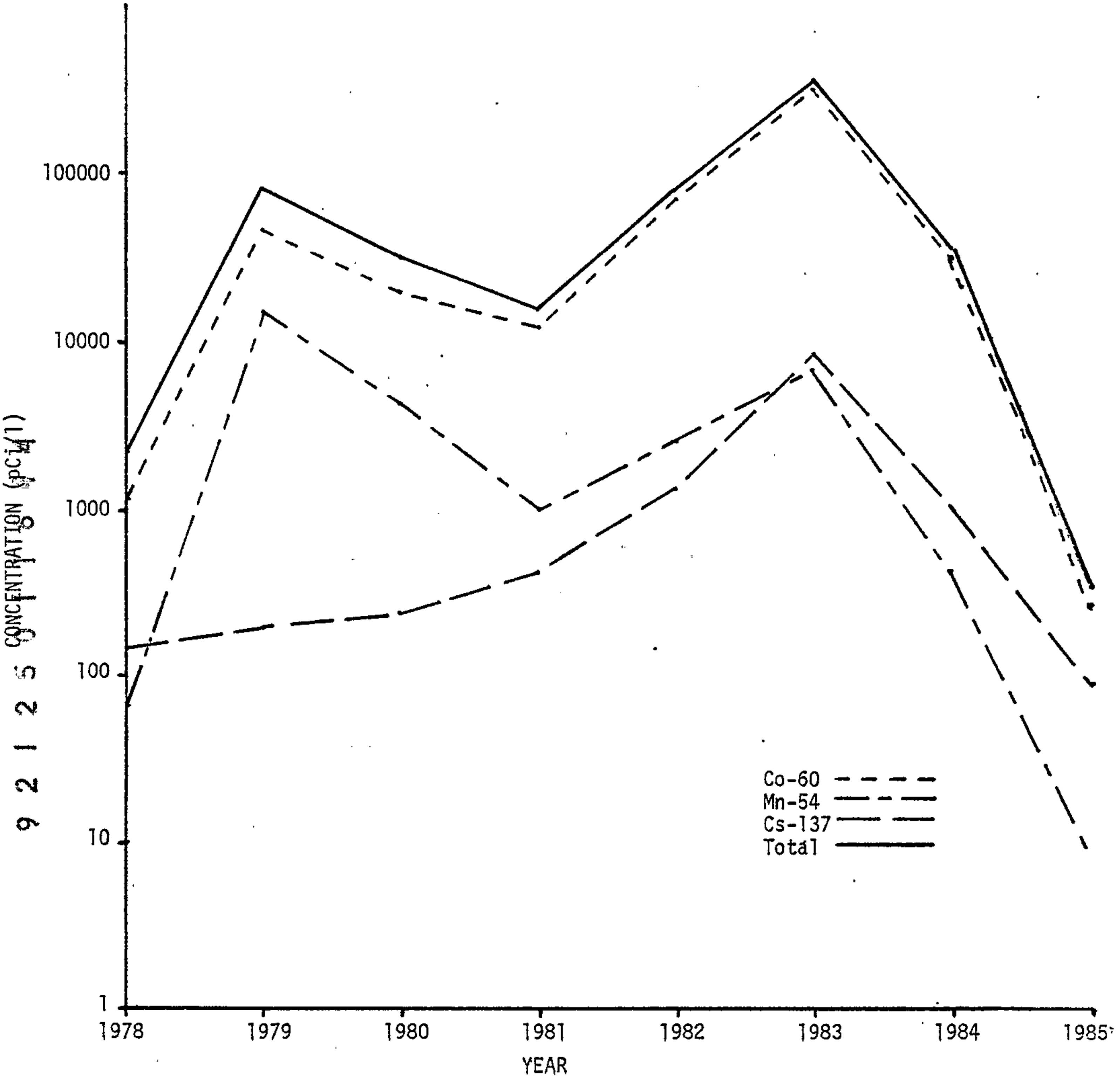

Figure 3.2 Average Annual Concentrations (pCi/l) of Major Radioisotopes and Total Concentration for the 1300-N EDB from 1978 to 1985.

*Year-to-date

Cesium-137 is a relatively long-lived radionuclide. Even small injections of this nuclide could become concentrated in the EDB effluent and account for the steady increase in concentration from 1979. Dilution appears to explain the decrease of all nuclides during 1984 and 1985.

Table 3.2.2 shows analyses of EDB samples taken during January and February 1985. These samples were filtered prior to radioanalysis. These data indicate the relative solubility of the various nuclides present. Manganese-54 and cesium-137 tend to form soluble cations. With the exception of the radio-iodines, the remaining radionuclides detected are relatively insoluble, probably in the form of oxides.

These analyses show that of the radioactive contamination present in the EDB effluent, much of the activity is found in the insoluble form. The fact that monthly samples taken from the EDB are drawn via a sampling line from near the bottom of the basin probably tends to concentrate the activity and overestimate the contamination of EDB effluent.

Sample #2 contained relatively elevated levels of iodine-131 and iodine-133. These short-lived fission products are found in primary coolant and occur in increased concentrations following a fuel element failure. Their presence is usually not detected in the EDB at levels above background due to their short half-lives. In the case of sample #2 the sample may indicate some valve leak-through. Radio-iodine levels in the EDB are very inconsistent. During 1982 and 1983 iodine was not detected in EDB samples. The sporadic occurrence of these short-lived nuclides is not considered a major contribution to biotransport of radionuclides from the 1300-N EDB Facility.

At the present time the concentrations of persistent nuclides in the EDB are below Table II limits. Steam generator systems are in excellent repair. It is not expected that steam generator blowdown will contain high levels of contamination in the immediate future.

TABLE 3.2.2

Concentrations of Radionuclides in Two Samples
from the 1300-N EDB

Filtrate Concentrations (pCi/l)

NUCLIDE	SAMPLE #1 (1-28-85)	SAMPLE #2 (2-14-85)
Mn-54	2.8E2	---
Fe-59	---	---
Co-60	---	2.9E3
ZrNb-95	---	---
Mo-99	---	4.7E3
I-131	---	1.5E3
I-133	---	2.2E3
Cs-137	3.1E2	3.2E3

Precipitate Concentrations (pCi/l)

NUCLIDE	SAMPLE #1 (1-28-85)	SAMPLE #2 (2-14-85)
Mn-54	7.2E1	5.2E2
Fe-59	1.9E2	---
Co-60	1.1E3	3.8E3
ZrNb-95	1.5E2	4.8E2
Mo-99	---	---
I-131	---	---
I-133	---	---
Cs-137	2.3E2	4.8E2

Table 3.2.3 shows the DOE 5480.1 Table II limits and half-lives for the radionuclides identified in the EDB samples. The limit for each nuclide is given for the lowest or most pertinent form. With the exception of the radio-iodines, none of the nuclide concentrations in the EDB exceed the Table II limits for an uncontrolled release to the environment.

TABLE 3.2.3

DOE 5480.1 Table II Limits for Liquid Release of Several Radionuclides

NUCLIDE	HALF-LIFE	CONCENTRATION (pCi/l)
Mn-54	312.5 days	1.0E5 (S)
Fe-59	44.6 days	5.0E4 (I)
Co-60	5.3 years	3.0E4 (I)
ZrNb-95	65.5 days	6.1E5 (I)
Mo-99	66.7 hours	2.0E5 (S)
I-131	8.0 days	3.0E2 (S)
I-133	21.0 hours	1.0E3 (S)
Cs-137	30.2 years	2.0E4 (S)

(I) = Insoluble Form
(S) = Soluble Form

4.0 BIOTRANSPORT OF RADIONUCLIDES

4.1 Mechanisms of Biotransport Within an Ecosystem

Radionuclides present in the food base of a particular organism may be retained and concentrated in the various tissues of the organism. Radionuclides may then be passed to any consumer of the contaminated organism. The action of possible concentration and subsequent passing of nuclides from one species to its predator is termed biotransport. In some instances upper trophic levels (predatory species) may contain higher concentrations of the radionuclides than the prey (Greager 1981).

There are several pathways of radionuclide transport between biotic components. Producers (plants) become radioactively contaminated by uptake of contaminated water and dissolved substances. Consumers (usually animals) become contaminated by ingestion of radioactive materials. Other pathways include inhaling of contaminated particles, or absorbing materials through the skin. Once contaminated, animals may transport radionuclides to higher trophic levels through the food chain (Eisenbud and Merril, 1973). Of primary importance in any study of biotransport are those food chains that lead to man. Owing to his diverse feeding habits, man is involved as the final, or top consumer in several different food chains.

The unique habits of organisms may also lead to other transport pathways. For example, the use of contaminated mud by various birds and insects can spread radionuclides through an ecosystem.

Radionuclides can be incorporated in several different biological processes within organisms. Radionuclides of biological importance tend to have metabolic pathways and end points where they accumulate.

The effective half-life of any radionuclide assimilated into a living organism is a function of the biological retention time and the physical decay time (half-life) of the particular radionuclide. The biological retention time is dependent upon the metabolic use and destination of the particular radionuclide. In general, biological retention is a short period of time compared to the physical half-life of the radionuclide (Doull, Klaason, and Amdur, 1980).

The concentration of radionuclides from one trophic level to the next trophic level can be expressed as a Concentration Factor (CF). The CF for a given radionuclide within a specific organism is a ratio of the radionuclide concentration within the organism to the concentration in the organism's food source:

$$CF = \frac{\text{Concentration in Organism}}{\text{Concentration in Food Source}}$$

Table 4.1 shows Concentration Factors of several important radionuclides for aquatic and terrestrial organisms. This information is given only as an indication of the bioconcentration effect of radionuclides. Specific concentration factors would need to be evaluated for each organism and its particular food base within a particular ecosystem. Bioconcentration appears to occur at a much greater magnitude in aquatic ecosystems than in terrestrial ecosystems (Kathren, 1984).

Table 4.1

Concentration Factors of Several Radionuclides in Aquatic (freshwater) and Terrestrial Ecosystems (Eisenbud and Merril 1973)

	AQUATIC		TERRESTRIAL		
NUCLIDE	PLANTS	ARTHROPODS	PLANTS	BIRDS	MAMMALS
Mn-54	150,000	125,000	>1	---	---
Fe-59	6,675	930	<1	---	---
Co-60	6,760	---	---	2	<1
I-131/133	69	---	---	<1	<1
Cs-137	970	---	<1	2	2-7

4.2 Potential of Biotransport of Radionuclides from the 1300-N EDB

The EDB is a sloped, metal basin, enclosed by a steel mesh fence, located within the protected portion of 100-N Area. The number and diversity of organisms that would be affected by contamination within the EDB is probably not large. This does not mean however, that it can be assumed that there is no impact on the surrounding ecosystem from contamination levels within the EDB.

The liquid effluent contained within the EDB could be transmitted to the immediate 100-N Area ecosystems by two inter-related mechanisms: 1) aquatic organisms that inhabit the basin water and 2) terrestrial organisms that consume the water and organisms residing in the EDB and are subsequently consumed as prey.

Although only a small group of organisms may actually utilize the EDB effluent, biotransport of assimilated radionuclides may occur. A short description of the feeding habits of each organism contacting the EDB effluent will be helpful in understanding the extent of biotransport associated with the EDB.

4.2.1 Organisms Inhabiting the 1300-N EDB

Producers

Diatoms (Chrysophyta) and colonies of blue-green algae (Cyanophyceae) and green algae (Chlorophyta) commonly inhabit any open, still body of fresh water. Temperature readings taken during January and February 1985 showed that the EDB water averaged about 42°F. This temperature range is about 6-8°F above normal Columbia River temperatures during the same time. Summer temperatures in the EDB would be expected to reach as high as 70-75°F depending upon the extent of heated generator blowdown discharged to the basin. Temperatures in these ranges are ideal for growth of microscopic phytoplankton communities within the basin waters.

Consumers

Several species of freshwater zooplankton would be expected to inhabit the EDB waters. The temperature ranges are satisfactory and an adequate food supply is present in the phytoplankton community. The zooplankton community would include unicellular organisms as well as microscopic species of crustaceans.

Aquatic insects have been observed in the EDB. Common species inhabiting, freshwater in this region would include water striders (Gerridae), backswimmers (Notonectidae), waterboatman (Corixidae), and diving beetles (Dytiscidae). Larvae of the cadisfly (Trichoptera), mosquito (Culicidae), and mayfly (Ephemeroptera) are likely seasonal inhabitants of the EDB waters feeding on the phytoplankton and zooplankton communities.

As shown in Table 4.1, aquatic organisms are very effective at concentrating radionuclides within their tissues. Bioconcentration here could result in contamination of organisms that utilize this food base.

4.2.2 Consumers Associated with the 100-N EDB

Mammals

Some species of mammals may utilize the EDB as a source of water and prey. The Norway rat (Rattus norvegicus) is a common inhabitant of buildings used by people. Proximity to the Columbia River would tend to increase the probability of finding these organisms within the confines of 100-N Area. The Norway rat feeds on human residues and some wild vegetation. It is possible that Norway rats could use the EDB as a source of water.

Bats have been observed on several occasions in 100-N Area. Bats common to the Shrub Steppe are the little brown myotis (Myotis lucifugous), the hoary bat (Lasiurus cinereus), and the silvery-haired bat (Lasionycteris noctivagans). These mammals are strictly predatory insectivores. The little brown myotis is commonly observed in 100-N Area and would feed on the insects that accumulate over a small body of water such as the EDB.

Birds

Passerine bird species are common seasonal inhabitants of 100-N Area. The cliff swallow (Petrochelidon pyrrhonota) and occasionally the barn swallow (Hirundo rustica) are particularly attracted to the sheltered area behind the 109-N building. Nesting sites here accommodate a large population of these species during the spring and summer months.

The cliff swallow is probably the most important consumer relating to biotransport of EDB contamination. This species uses the EDB as source of water and also feeds on the community of insects associated with the basin. Swallows can be a source of prey for several of the raptors and other top consumers of the shrub steppe. Also, the use of contaminated mud and water by these birds to build nests can be a pathway for spreading contamination.

4.2.3 Potential Pathways to Man

The significant concern of all studies of biotransport is food chains that involve man as a consumer. None of the food chains described in the previous sections normally involve man as a member. EDB effluent is not directly routed to any waterway that is used as a source of drinking water. No noticeable leakage of the effluent to the Columbia River has ever been detected. All EDB effluent is discharged to the 1301-N/1325-N LWDF.

On March 6, 1985 the water level in the EDB facility was reported to be very low. The layer of sludge deposited in the bottom of the tank was exposed and deposits at the margins of this sludge "heel" were drying. The EDB is normally maintained at an intermediate water level by means of a submersed pump that is activated by a manual on-off switch. Evidently operators responsible for draining the basin had activated the pump and were unaware of the extent to which the basin water had been withdrawn. The problem was quickly rectified by diverting clean water to the EDB.

If allowed to dry, the contaminated deposits in the bottom of the EDB could be transported by wind. The actual extent of contamination to the environment would probably be minimal as the EDB is generally sheltered from the prevailing winds and the force of wind required to resuspend the fine textured deposits would be large due to the limited surface area of the sludge heel. This event does however, indicate a potential pathway of radionuclide release to the environment.

Wind blown contamination could directly enter a food chain after deposition. Direct inhalation of the resuspended particulate material could be a hazard to N Plant personnel in the vicinity. This pathway may be the most important method of biotransport of contaminants to man.

4.3 Radioanalysis of Swallow Nests and Excrement

Several studies have been conducted of organisms inhabiting the Hanford Site to determine uptake and transport of radionuclides. Much of this data base concerns the general geographic area with little information specifically relating to the immediate environment of 100-N Area. The mobility of many of the species involved in shrub steppe ecosystems makes conclusive results relating to a single area very difficult. In 1981 a series of studies were conducted to evaluate biotransport of radionuclides related to the 1301-N LWDF trench. A direct result of that study was the construction of a concrete cover over the LWDF trench.

As discussed earlier a large population of swallows regularly inhabits the region associated with the 1300-N EDB and utilizes the basin area for nourishment and shelter. In 1979, samples of swallow nests and excrement were collected in 100-N Area and analyzed for radionuclide content. Table 4.2 summarizes some of the results of that study. It was hypothesized that the elevated levels of radionuclides were contained within the mud used to build their nests. It was thought that the main source of mud was the 1301-N LWDF trench. Efforts were undertaken to discourage the use of contaminated mud and alternate sources of mud were provided for nest building. Contamination from the nearby EDB was not considered as a major contribution to the identified nest contamination levels.

TABLE 4.2

Radionuclide Concentrations (pCi/g) of Swallow Nests and Excrement Samples Collected Near the 1300-N EDB During 1979 (Diediker, 1979)

	SWALLOW NEST SAMPLES						
NUCLIDE	1	2	3	4	5	AVERAGE	EXCREMENT
Mn-54	2.5	1.9	.14	---	.27	1.2	---
Co-60	19	.15	1.2	.64	1.5	7.5	17
Cs-137	2.9	5.5	.28	---	.19	2.2	---
Nd-147	---	---	---	.45	---	.45	---

Composite samples of nest mud, egg shells and embryos, and excrement were collected from the cliff swallow colony located near the 1300-N EDB on June 19, 1985. The samples were analyzed for gamma emitting radionuclides using eight hour counting times. Table 4.3 summarizes the data from the samples.

TABLE 4.3

Radionuclide Concentrations (pCi/g) of Cliff Swallow Nests, Excrement, and Shell/Embryo Samples Collected Near the 1300-N EDB During 1985

NUCLIDE	NEST SAMPLES 1	NEST SAMPLES 2	EXCREMENT	SHELL/EMBRYO
Mn-54	.26	.29	---	---
Co-60	1.2	1.1	5.1	4.2
Cs-137	.31	.29	---	---

A comparison of the 1979 data to the 1985 data shows a decrease in the amount of activity between the two sample years. With the exception of Co-60, the current values are a factor of 10 less than the 1979 values. The 1985 nuclide levels in the nest mud are approximately equal to background levels found in the 100-N Area. These data provide further evidence that the source of nest contamination in 1979 was associated with the open 1301-N Effluent Trench. It would appear that use of the EDB for drinking and feeding does result in accumulation of Cobalt-60. The concentrations are small and would not lead to a large amount of biotransport to the immediate environment. This pathway, ending with the cliff swallows that inhabit the basin area, is probably the main biotic pathway that could lead to transport of radionuclides from the 1300-N facility.

5.0 ALTERNATIVE ACTIONS CONCERNING 1300-N EDB FACILITY

Contamination levels within the EDB are presently at low levels. This condition should continue although future operational practices could raise contamination levels in the basin. However, due to the fact that the EDB is an open air basin, transport of contamination to the immediate environment remains possible. Swallow nest and excrement samples indicate that biotransport from the EDB is negligible. The major transport pathway would be related to operation and radiological control of the basin. The relative lack of attention given to this open, contaminated basin could lead to a hazardous situation, as in the case of the exposed sludge layer. If unnoticed for a long enough time, an uncontrolled release of contamination could result. Several courses of action or combinations thereof should be evaluated concerning safe operation and maintenance of the EDB. The following discussion includes several feasible alternatives.

In order to maintain a degree of shielding and a reservoir of cool water capable of quenching discharged hot water, it is necessary to regulate water levels in the basin. At the present time this operation may be inadequate. Several modifications could be made to aid in efficiency: 1) paint level indications on the side of the basin or at least high and low markings, 2) install water level instrumentation and 3) tie level instrumentation into the discharge pump switch. These modifications should assure continuous water levels and adequate effluent discharge from the basin while also decreasing the chance of operator error.

Another approach may be to attempt to remove excess contamination from the basin. This could be accomplished by draining the basin and removing the built up sludge layer. A corresponding program of periodically draining and refilling of the basin may prevent further build up of a contaminated sludge layer. The initial cleaning operation would require a large number of manhours and possible personnel exposure. Also the integrity of the basin itself must be considered. It is entirely possible that this cleaning operation would create or at least uncover the need for repairs to the basin structure. It is possible that portions of the 21 year old steel liner are structurally weak. Regular surveillance of ground water well #N-24 located between the EDB and the Columbia River has not indicated any evidence of leakage of the basin effluent to the local ground water. The nature of the basin construction and the age of the basin indicate however, that it may be susceptible to leakage if disturbed.

It will also be necessary to continue to discourage the nesting of local cliff and barn swallows in the vicinity of the EDB. This operation is not desirable from an ecological standpoint but may be necessary if the birds continue to have uncontrolled access to the basin.

In light of the prospect of continued operation of N Reactor and the controversial nature of having an open source of contamination within the immediate plant area, it may be desirable to consider more permanent measures to eliminate the potential for biotransport. In this case it may be necessary to evaluate construction of a cover over the EDB Facility. Pre-cast concrete panels similar to those currently being designed as a cover over the 1325-N LWDF extension trench could be obtained in lengths suitable for the EDB. These panels could be transported to the EDB facility via the adjacent rail spur. The concrete panels could then be put into place with the aid of a portable crane. It may be necessary to reinforce the concrete curb that presently surrounds the EDB facility as it was not designed to carry such a load. Level instrumentation and leveling switches connected to the discharge pump should also be installed.

Another alternative would be to remove the EDB entirely. Steam generator blowdown could easily be routed to the 10" RDR line for direct disposal to the 1301-N/1325-N LWDFs. Or, it would also be feasible to route the blowdown to the Emergency Dump Tank by way of the 30" flush line. This would provide a temperature quench as well as a route to the LWDFs. The EDB could then be decontaminated and removed. After backfilling, this area could be used for other facilities.

It may be desirable to implement some of the less costly alternatives immediately in order to assure radiological control of the EDB effluent. Review of the effect of these modifications may then lead to further action using some of the more permanent and more costly alternatives.

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